14 TRANSPORT

Chapter 14 addresses the potential impacts of the Queensland Curtis LNG (QCLNG) Project's Gas Field Component construction and operations activities on transport networks.

The key interactions of the Gas Field activities with transport networks will be through transportation of plant, equipment and materials for field development. Trips by construction personnel (work-based and non-work-based) will also generate traffic.

A preliminary transport and logistics study has been carried out for Gas Field construction activities and is provided in *Appendix 3.7.*

In this section the following terminology has been used:

- trucks: the number of semi-trailer equivalent loads required to transport materials
- trips: one trip is the movement of a vehicle from its origin to its destination. The return movement is counted as a separate trip. Thus one truckload will normally equate to two trips.

14.1 PROJECT ENVIRONMENTAL OBJECTIVE

The Project environmental objective for transport is to ensure that use of roads, rail and other transport infrastructure does not impact on ecological health, public amenity or safety of those who use or are in proximity to transport infrastructure.

A transport strategy had not been finalised at the time this document was prepared. However, once developed the strategy is expected to address shipping, road and rail activities and their impacts.

The Reference Case used in this Environmental Impact Statement (EIS) to identify transport impacts has been developed as a worst-case scenario. A number of options have been investigated and identified for further analysis once suppliers of materials, equipment and locations of key services have been finalised in the detailed design phase of the Project.

14.2 EXISTING ENVIRONMENT

14.2.1 Environmental Impact Assessment

The Gas Field development is located within the Surat Basin in the area generally between Wandoan, Jackson, Dalby and Tara. Activities could potentially impact on the following key environmental values:

- conditions of transport network infrastructure and safety of transport network users
- vegetation communities through clearing of land within road reserves and introduction and/or spread of pest species and diseases
- air environment due to dust generation from transport on unsealed roads
- the ambient noise due to increased traffic volumes.

This chapter predominantly assesses the impacts from transportation of goods and services required for the proposed Gas Field Component construction and operation on existing transportation services such as roads, railways and shipping infrastructure.

Clearing of vegetation has been addressed in *Volume 3, Chapter 7*.

The presence of pest species and the management of construction activities to prevent the spread of pest species and disease have been addressed in *Volume 3, Chapter 7.*

Dust control and erosion management are addressed in *Volume 3, Chapter 4.*

Noise management is addressed in *Volume 3, Chapter 13.*

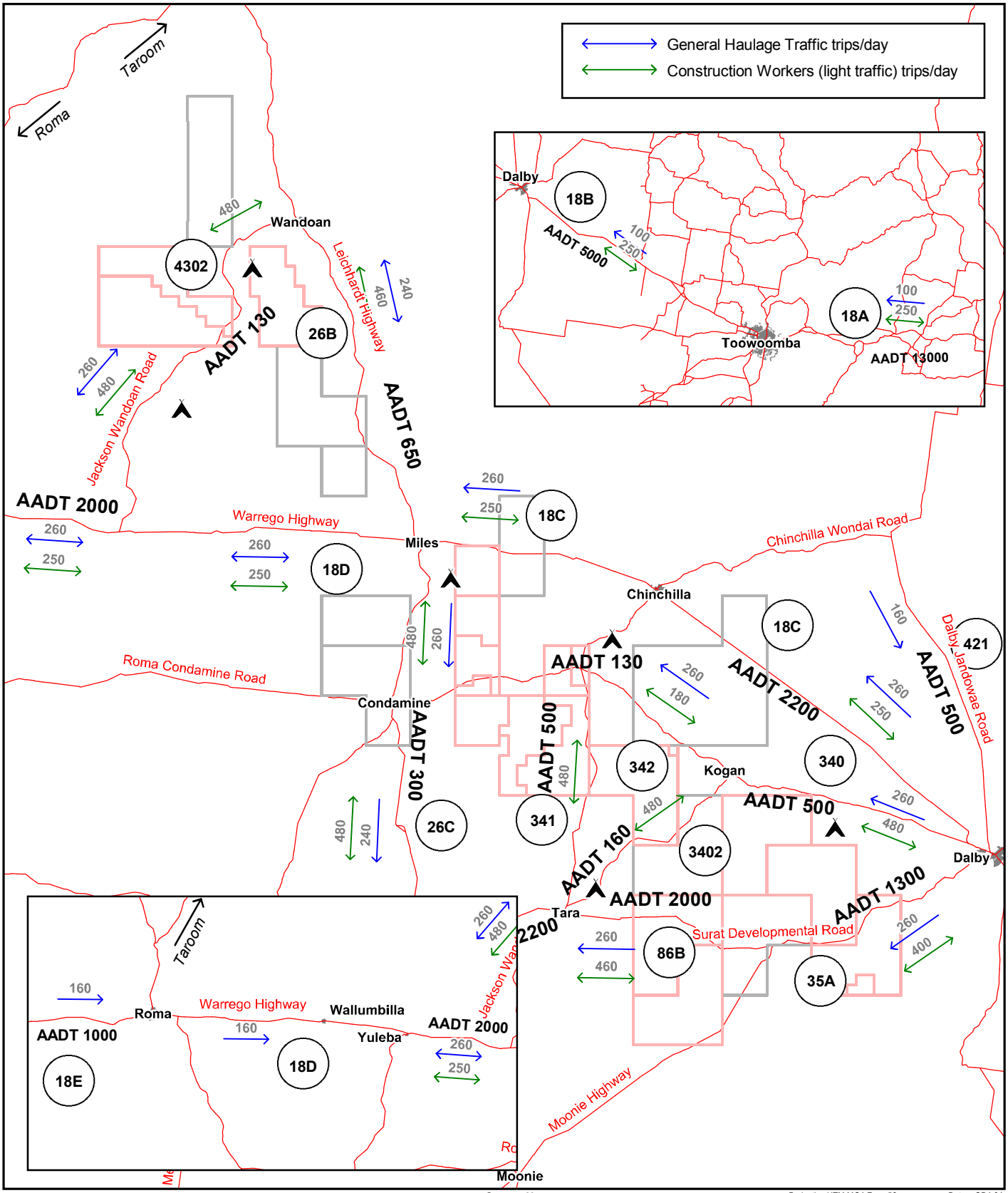
14.2.2 Existing Road Network

The key state-controlled road links and key council-controlled road links that provide access to the Gas Field area are described in *Table 3.14.1* and are shown in *Figure 3.14.1*. These routes have been estimated based on the most likely access points to the worksites.

Table 3.14.1 Key State-Controlled and Council-Controlled Road Links

Road	Description
State-Controlled	
Chinchilla-Tara Road	The Chinchilla-Tara Road is part of the district road network. The road has two bitumen-sealed lanes with predominantly unsealed shoulders. The posted speed limits in rural areas are generally 100 kph and through townships 60 kph.
Dalby-Kogan Road	The Dalby-Kogan Road is part of the regional road network. The road has two bitumen-sealed lanes with predominantly unsealed shoulders. The posted speed limits in rural areas are generally 100 kph and through townships 60 kph.
Jackson-Wandoan Road	The Jackson-Wandoan Road is part of the district road network The road has two bitumen-sealed lanes with predominantly unsealed shoulders. There are some one-lane bitumen-sealed floodways along the road. The posted speed limits in rural areas are generally 100 kph and through townships 60 kph.
Kogan-Condamine Road	The Kogan-Condamine Road is part of the regional road network. The road has two bitumen-sealed lanes with predominantly unsealed shoulders. The posted speed limits in rural areas are generally 100 kph and through townships 60 kph.

Leichhardt Highway	The Leichhardt Highway is part of the State Strategic Road Network connecting Central Queensland with the Newel Highway on the Queensland-New South Wales border near Goondiwindi. The highway is bitumen-sealed with sections of sealed shoulders and other sections with unsealed shoulders. The posted speed limits are generally 100 kph in rural areas and 60 kph through towns.
Moonie Highway	The Moonie Highway is part of the regional road network and connects Cunnamulla with Dalby (and the Warrego Highway). The highway is bitumen-sealed with sections of sealed shoulders and some sections with unsealed shoulders. The posted speed limits in rural areas are generally 100 kph and 60 kph through towns.
Surat Development Road	The Surat Development Road is part of the district road network. It connects Surat with Dalby. The developmental road has two bitumen-sealed lanes with predominantly unsealed shoulders. The posted speed limits in rural areas are generally 100 kph and through townships 60 kph.
Tara-Kogan Road	The Tara-Kogan Road is part of the district road network. The road has two bitumen sealed lanes with predominantly unsealed shoulders. The posted speed limits in rural areas are generally 100 kph and 60 kph through townships
Warrego Highway	The Warrego Highway is part of the national road network between Brisbane and Darwin. Between Dinmore and Toowoomba the highway is a divided four-lane roadway. Through Toowoomba the highway follows Cohoe, James, and Tor Streets, which are four lanes undivided before following Bridge Street, which is a four-lane median divided until the suburb of Torrington, where the road becomes a two-way two-lane road to Morven. West of Toowoomba the road is sealed with sections of sealed and unsealed shoulders.
Dalby-Jandowae Road	The Dalby-Jandowae Road is a Regional Road in the State-Controlled Road Network connecting Dalby to Jandowae. The road would be used for haulage of materials from the quarry north of Dalby. The sealed road is two-lane with unsealed shoulders
Regional Council	
Beelbee Road	Beelbee Road runs north and south off Kogan-Condamine Road. In the southerly direction it runs through Beelbee and terminates at the intersection with Braemar Boundary Road. Not covered in site visit; no pavement condition details available.
Fairymeadow Road	With a 6 to 8 m-wide sealed, unmarked pavement width, Fairymeadow Road runs west from the transition with Greenswamp Road to the intersection with Leichhardt Highway.
Kumbarilla Lane	Kumbarilla Lane provides a link between Daandine on Kogan-Condamine Road in the north and Kumbarilla on Moonie Highway in the south. Not covered in site visit; no pavement condition details available.
Gadsby's Road	Gadsby's Road intersects with the Jackson-Wondoan Road and provides access to the areas area west of the Jackson-Wondoan Road. The road is paved and unsealed, one to two lanes wide, with no shoulders. The grids on the road are single-lane.
Gurulmundi Road	Gurulmundi Road provides a connection between the Leichardt Highway and the Jackson-Wondoan Road. The site visit covered a section of approximately 5 km at the Jackson-Wondoan Road end. Over this section, the road is paved and unsealed and one to two lanes wide with no shoulders.
Old Moonie Road	Old Moonie Road connects the Leichhardt Highway 13 km north of Moonie to Weranga and runs in parallel to the Moonie Highway. The road was not covered in the site visit; no pavement condition details are available
Weranga North Road	Weranga North Road connects the Surat Developmental Road with the Kogan-Condamine Road. It is paved and two-lanes wide with single-lane concrete causeways. This road is unsealed.



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	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: Mipela	**Volume** 3 **Figure** 3.14.1	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved: CD	File No: QC02-T-MA-00057	
	Date: 10.06.09	Revision: A	

14.2.3 Existing Road Traffic Volumes

Data has been obtained from the relevant Department of Transport and Main Roads (DTMR) regional office (i.e. Darling Downs and South West) in relation to the existing traffic volumes on potentially affected State-controlled roads. This data is summarised in *Table 3.14.2* and average values for the potentially affected sections are shown on *Figure 3.14.1*.

The full data, including the annual average daily traffic (AADT) and percentage of commercial and heavy vehicles used in the analysis, is provided in *Appendix 3.7.*

No traffic data has been sourced for local roads. However, based on the traffic volume on lesser State-controlled roads in the area, AADT on the Local Government roads would be expected to range from 20 to 200 vehicles.

Table 3.14.2 Existing Traffic Volumes

Road	Section	DTMR Identifier	AADT
Warrego Hwy	Ipswich-Toowoomba	18A	13,000-20,500
	Toowoomba City		19,800-22,000
	Toowoomba-Dalby	18B	4400-17,500
	Dalby-Miles	18C	2100-6500
	Miles-Roma	18D	1200-3000
	Roma -Mitchell	18E	750-1028
Leichhardt Hwy	Taroom-Miles	26B	600-700
	Miles-Goondiwindi	26C	300-3,400
Moonie Hwy	Dalby-St George	35A	1300-6400
Surat Developmental Road	Surat-Tara	86A	300- 2200
	Tara-Dalby	86B	600-2200
Dalby-Kogan Road		340	300-500
Kogan-Condamine Road		342	130
Chinchilla-Tara Road		341	350-720
Tara-Kogan Road		3402	160
Jackson-Wandoan Road		4302	70-200
Dalby-Jandowae Road		421	600-800

14.2.4 Existing Rail Network

The Western Line connects Brisbane to Miles and could potentially be used for transporting pipe and other materials for the construction phase. The line is a standard Queensland 1067 mm gauge track with a mix of timber, steel and concrete sleepers.

The Queensland rail network typically accepts rolling stock of a 16.2 m body length, but can accommodate longer lengths where overhang to another wagon is necessary (e.g. transport of pipe).

14.2.5 Shipping

The major impacts to shipping relate primarily to the LNG Facility and have been discussed in *Volume 5, Chapter 15*. It is likely that the compressor units will be imported from overseas, entering Australia through the ports of Brisbane or Gladstone.

14.3 POTENTIAL IMPACTS AND MITIGATION MEASURES

14.3.1 Transport Methods

It is expected that plant and materials for development of the Gas Field will be delivered by a combination of shipping, rail and road transport. Detailed analysis of the transport logistics is still to be undertaken. This data will be specific for materials and equipment from port of origin to site delivery.

This section sets out the potential transport numbers that may be generated based on the information at the time of the analysis and assumes that all transport will be by road. This has enabled QGC to identify areas where the potential impact is greatest. This information will be taken into account in formulating the final transport strategy that will be agreed with DTMR.

The key items to be transported will be:

- well site equipment
- interconnecting pipes for gathering lines
- screw and reciprocating compressors
- triethylene glycol (TEG) units
- campsite components (modular buildings)
- fuel
- heavy plant for construction and well development (e.g. drill rigs, bulldozers, drill rigs, graders, trucks, scrapers, trenchers, rock cutters, excavators, loaders, side-boom tractors, cranes, forklifts, generators, welders, compressors, wheel-ditching machines and water trucks)
- quarry materials.

There will also be daily movements of construction vehicles servicing the camps, movement of personnel to and from the work areas and dust management.

Infrastructure for the management or treatment of Associated Water will also need to be transported. The transport of this infrastructure is not currently accounted for in the transport assessment, but will be included during the detailed design phase.

14.3.1.1 Well site equipment

Well site equipment will include general materials, bore casings, separator units and drilling machinery, as set out in *Table 3.14.3*. The delivery of the bore casings and general well products are expected to require two trucks per well, whereas a single truck delivering six separator units would service six well sites.

Table 3.14.3 Truck Volumes for Well Site Equipment

Equipment	Total trucks	Trips/day	Approximate number of days
General products	11,992	6	3997
Bore casings	11,992	12	2004
Separators	1008	2	1008
Total	**24,992**	**20**	

14.3.1.2 Interconnecting pipes for gathering lines

Steel and high-density polyethylene (HDPE) pipes will be required for the various pipelines associated with the transport of gas and water within the Gas Field. This material is expected to be transported to the site from Brisbane. Assuming about 1400 km of steel pipeline and 3000 km of HDPE pipeline will be installed within the first five years (i.e. peak construction period) this would generate the transport volumes set out in *Table 3.14.4*.

Table 3.14.4 Truck Volumes for Pipe Deliveries

Pipe description	Approximate length (km)	Pipe diameter (mm)	Total trucks	Approximate trips/day
Steel interconnect pipe	1000	315	3586	4
Poly interconnect pipe	1000	315	1032	2
Water collection pipe (poly)	2000	450	4032	2
FCS to CPP pipe (steel)	400	315	1431	4
Total	**4400**		**10,106**	**12**

14.3.1.3 Screw and reciprocating compressors

Compressor units are expected to be transported to the site by road from Brisbane. A Field Compression Station (FCS) and a Central Processing Plant

(CPP) will occupy three truckloads each. This will generate the transport requirements set out in *Table 3.14.5.*

Table 3.14.5 Truck Volumes for FCSs and CPPs

Compressor type	Total trucks	Trips/day	Approximate number of days over the life of the Project
Screw	648	16	81
Reciprocating	270	20	27
Total	**918**		**108**

14.3.1.4 Triethylene Glycol units

The triethylene glycol (TEG) units are expected to be delivered by road from Brisbane. The TEG units are an integral component of the CPPs. Each CPP requires five TEG units. Transport of a single TEG unit and its supporting equipment requires three semitrailers, resulting in the transport requirements set out in *Table 3.14.6*.

Table 3.14.6 Truck Volumes for Delivering TEG Units

Component	Total trucks	Trips/day	Approximate number of days over the life of the Project
Triethylene glycol unit	135	6	45

14.3.1.5 Campsite components (modular buildings)

Camp facilities will be sourced from within Australia and it has been assumed that this will be from south-east Queensland.

The transport requirements for each camp are set out in *Table 3.14.7*. As discussed in *Volume 3, Section 12.6.4*, five to seven camps could be established during the peak construction period. This would total between approximately 3,170 and 4,440 truckloads or between 6,340 and 8,880 trips.

Table 3.14.7 Truck Volumes for Construction of a Camp

Item	Quantity of item	Units required	Truck loads
Rooms	230	12 m x 3 m	230
Central ablution	7	12 m x 9 m	21
Mess	2	12 m x 33 m	22
Recreation room	1	12 m x 33 m	11
Offices	3	12 m x 33 m	33
Furniture and fittings			317
Total trucks per camp			**634**

14.3.1.6 Fuel transport

Based on fuel usage for wells currently under construction, it is estimated that some 273 million litres of fuel will be required over the life of the Project. It is

assumed that the fuel will be hauled from Brisbane in 25,000-litre tankers at an average rate of three tankers per day during the peak construction period. The haulage of the fuel is set out in *Table 3.14.8*.

Table 3.14.8 Fuel Supplies

Equipment	Total trucks	Trips/day	Approximate number of days
General fuel	10,920	6	3640
Total	**10,920**	**6**	**3640**

14.3.1.7 Heavy plant

Earth-moving and heavy-lifting equipment will be required for preparation of the well and compressor station sites as well as for the access roads and gas and water-gathering pipelines. This will include bulldozers, graders, rollers, excavators and cranes. The anticipated transport numbers required to move this equipment are presented in *Table 3.14.9*.

Table 3.14.9 Heavy Plant – Required Quantities

Plant item	Transported via	Quantity required	Truck loads
Bulldozers	Semitrailer	10	10
Graders	Independent	20	20
Rollers	Semitrailer	5	8
Excavators	Semitrailer	20	20
Boom cranes	Independent	4	4
Heavy cranes	Independent	2	2
Drill rigs	Independent	20	20
Total			**84**

14.3.1.8 Quarry Material

Quarry material will be required for the construction of up to 2000 km of access roads and for preparation of well sites, compressor stations, camp sites and any other hardstand areas.

Access roads are expected to be approximately 4 m wide with 0.15 m depth of gravel. The hardstand area for each well site will be approximately 50 m x 50 m. For the FCS and CPP facilities, each hardstand site will be approximately 250 m x 250 m.

The amount of hardstand required for each camp will depend upon the location, but for the purposes of this assessment it has been estimated that 6000 m^3 per camp will be required.

The quantities of quarry material required for the development of the Gas Field are illustrated in *Table 3.14.10*.

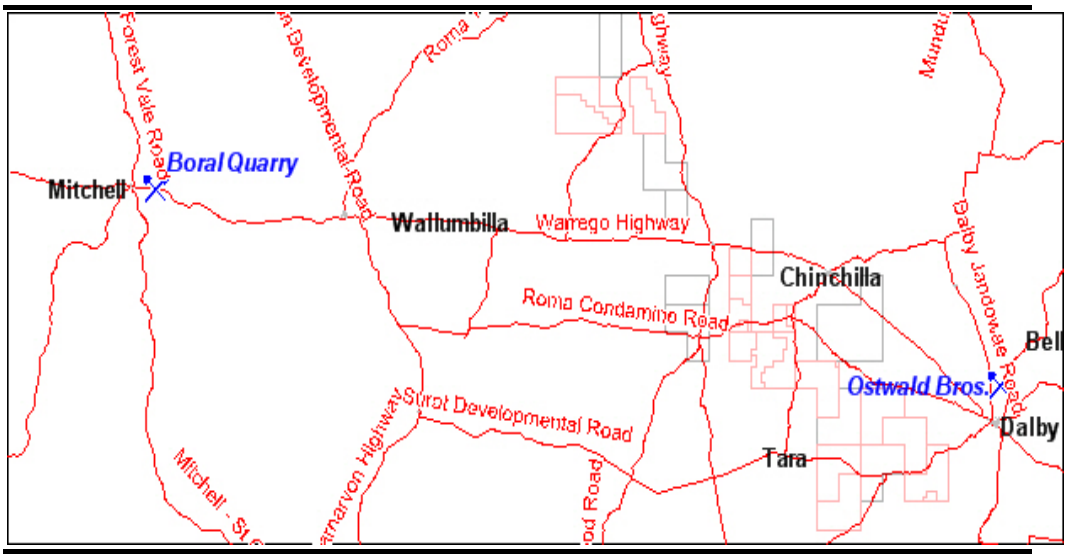
Table 3.14.10 Quarry Material Requirements

Item	Material	Volume (m^3)	Approximate weight (tonnes)	Truck loads (28 t/truck)
Camps	Gravel	30,000	72,000	2570
Access tracks	Gravel	1,000,000	2,400,000	85,720
CPPs	Gravel	47,000	113,200	4040
FCSs	Gravel	101,000	242,600	8660
Well heads	Gravel	2,250,000	5,400,000	193,000
Total		**3,428,000**	**8,227,800**	**293,990**

Two existing quarries have been identified with the potential to support the Gas Field: one north of Dalby and one east of Mitchell (refer *Figure 3.14.2*).

Excavated subsoil is not expected to be removed from the site, but to be redistributed across the area and stockpiled for rehabilitation purposes, where it is suitable.

Figure 3.14.2 Quarry Locations



14.3.1.9 Camp and Personnel Traffic

As discussed in *Volume 2, Chapter 11,* it is anticipated up to 2000 personnel will be required at the peak of the construction period. These personnel are expected to be accommodated in dedicated camp facilities.

It has been assumed that transport between the accommodation and work areas will be by four-wheel-drive vehicles carrying two personnel per vehicle. This is considered a worst-case scenario for the initial assessment of the road impacts. However, QGC anticipates using buses to transport workers from camps to work locations, greatly reducing the initial estimated impact. This will be investigated further during the detailed design phase of the Project.

Personnel rosters have been nominated at a 21-days-on, seven-days-off rotation. The rotations will be staggered and it has been assumed that, on any one day, 25 per cent of the total personnel will leave the camp on the final day of the working roster while 25 per cent will return to commence their roster.

The number of trips likely to be generated due to camp and personnel is set out in *Table 3.14.11*.

Table 3.14.11 Generated Personnel Traffic Movements

Purpose	Description	Employees/ camp	Trips/day	Vehicle occupancy	Trips/day/ camp
Camp servicing	General deliveries	20	2	1	40
Workshop servicing	Deliveries: in and out	10	2	1	20
Personnel	Worker transport to site	400	2	2	400
Office	Office-related activities	20	1	1	20
Personnel	Non work-based trips	450	0.4	1.2	150
Personnel	7-day-off trips	150	2 every 7 days	1.2	250

14.3.1.10 General supplies

In addition to the above requirements there will be a need for transport of general supplies, as set out in *Volume 2, Table 2.11.8*. However, this is expected to generate only one truck per day, which is negligible when considered with other transport requirements.

14.3.2 Traffic Generation

Assessing potential impacts on the road network at this early stage of the Project requires a number of assumptions in relation to the distribution of the activities described in *Section 14.3.1*. The assumptions adopted for this preliminary assessment were:

- generated traffic on each road assumes the peak year of construction (i.e. 500 wells per year)
- compressor stations will be developed progressively in relation to the wells.

An estimate of the potential generated transport numbers has been made in *Appendix 3.7 Table 3.1*. This has been summarised in *Figure 3.14.1.*

14.3.3 Road Impacts

Potential road impacts include:

- use of roads during construction by extendable semitrailers delivering

equipment and materials to worksites

- use of roads by low loaders mobilising construction equipment between worksites
- increased traffic movement in rural townships (e.g. Wandoan, Miles, Chinchilla, Tara)
- transporting construction personnel to worksites
- construction near a road
- open-cut crossings of unsealed roads during installation of gas and water-gathering pipelines.

These actions may cause:

- localised traffic congestion or disruption
- increased safety hazards
- accelerated deterioration of road pavement
- introduction and/or spread of pest species
- increased noise for residences adjacent to roads
- dust nuisance to residences.

These are discussed in more detail in *Section 14.3.3.1*.

14.3.3.1 Traffic Congestion

Transport

Transportation impacts include increased volumes and slow-moving traffic potentially creating disturbance to local traffic and motorists. Traffic will increase near any given construction location with transport of materials, plant, equipment, fuel and construction personnel. The activities will be spread throughout the Surat Basin rather than concentrated in a single location, which should minimise congestion.

The greatest disturbance is expected on rural roads, where the entire road breadth may be needed by semitrailers. Movement of heavy vehicles in areas with steep inclines (i.e. slopes of 6 per cent or greater) such as the Toowoomba Range could cause some slowing of other traffic. However, the number of additional heavy vehicles anticipated through this area (i.e. about 100) is not expected to be noticeable within the existing 13,000 AADT on this route.

The peak transport period will be during the first four years (i.e. 2010 - 2013) when the Project builds to Project delivery. During this period, camps will be established, the bulk of the compressor stations will be installed and up to 2000 personnel will be employed in the field. The ongoing traffic after this period will relate to the installation of wells, gas and water-gathering pipelines and associated access roads, with personnel numbers expected to drop to about 800 for operations.

Construction within the Road Reserve

There may be localised traffic disruption associated with constructing a gas or water-gathering pipeline across a road corridor. This work would mainly be on unsealed local roads, which are typically open-cut, and can take up to six hours to complete. Traffic delays may occur. However, QGC and its contractors will put in place bypass or detour options agreed with the local road manager (e.g. DTMR, regional council) prior to the commencement of these crossings.

Any construction within a road reserve will be agreed with the relevant authority and conform to statutory requirements. If the road is State-controlled, an application for an Ancillary Works and Encroachment Permit will be made to the DTMR, with supporting documentation detailing the proposed crossing method and depth of cover.

Traffic Mitigation Methods are set out in *Section 14.3.6.*

14.3.3.2 Increased Safety Hazards

The increase in traffic volumes on roads throughout the Project area potentially increases safety hazards. A safety check has been carried out as part of the preliminary transport study (refer to *Appendix 3.7).* This check considered:

- intersections and access
- pedestrians, cyclists and motorcyclists
- school bus routes.

Intersections and Access

It is anticipated that the intersection of some existing local government roads with DTMR roads in the Surat Basin will be below the normal safe intersection criteria. It could therefore be necessary to carry out works to improve the sight distance at some intersections. This will be reviewed further during the detailed design phase of the Project.

The intersection of any access roads set up specifically for the Project with state- or local government-controlled roads will conform to the requirements of the relevant authority.

Pedestrians, Cyclists and Motorcyclists

The assessment found that the haulage of materials will predominantly occur along rural highways and roads where impact to pedestrians, cyclists and motorcyclists is unlikely.

The key interaction with other roads users is likely to be associated with construction workers travelling between the Gas Field and the townships of Miles and Chinchilla for recreation or personal reasons, with some effect also

likely around Tara. These interactions will be examined when camp locations are finalised.

QGC emphasises safety for both its workers and the local community. An extensive consultation program is underway (refer to *Volume 8, Part A),* and will be expanded during the construction phase to ensure that local communities are aware of key transport timings that could affect them.

School Bus Route

School bus routes occur along a number of the roads the Project proposes to use. Construction personnel movements would normally be outside of school hours, starting earlier and finishing later than school bus pick-up and set-down times.

Delivery of materials and equipment may occur throughout the day and therefore truck movements may interact with school bus times. The interaction of haulage traffic and school pick-up and set-down times will be assessed on a road-by-road basis during detailed design. A Transport Management Plan will be implemented to ensure the safety of all school bus routes.

As the local area school-age children demographic changes, any bus route amendment must reflect community needs. This action must be analysed immediately prior to the commencement of Project construction activities and revised each school year.

Hazard Review

In addition to the safety check carried out as part of the transport assessment, QGC conducted its own hazard and risk review of transport issues. This hazard review considered impacts of transport with respect to:

- location
- project areas and types of activities
- types of road use
- frequency of road use
- road types
- other users.

The review found the types of transport that have the greatest potential impacts are general truck transport, pipe truck transport and large numbers of light vehicles. The locations that will possibly have the highest traffic frequency leading to hazards will be in the vicinity of the Gas Field, where there is adjacent construction activity and other industry.

The Project also identified potential measures and processes that will be considered in planning controls to reduce these impacts. Measures include:

- Transport of pipe by rail will be considered as a means of reducing the frequency of pipe truck movements by road

- Much of the heavy transport required is not of a significant frequency and will require escorts and traffic management plans to reduce the hazard impacts
- In order to reduce risks associated with general truck transport, QGC will conduct audits of all transport companies, their transport practices and standard of equipment. QGC will require its contractors to meet strict company standards for driving skills, experience and fatigue management. In addition, QGC will ensure that transport companies are compliant with the National Transport Commission Guidelines, including those for fatigue management
- A Traffic Management Plan will be developed in consultation with affected communities. Following consultation, QGC will instigate information sessions, publicity and signage to communicate changes in traffic conditions
- QGC's Safety Management System to be developed for the Project will have a key focus on the driving and transport issues, and implement a range of requirements for the entire Project and all its contractors.

QGC will develop a Transport Management Plan during FEED to identify, in detail, transport logistics, potential impacts from transport on transport networks and the safety of road users, as well as mitigation measures to reduce these impacts.

14.3.3.3 Road Pavement Integrity

Vehicle and equipment movement during construction may result in localised damage to the road pavement or surface.

A study has been carried out to assess the potential impacts on assumed transport routes (refer to *Appendix 3.7*) based on the estimated project traffic (refer *Section 14.3.1*).

The current pavement loadings on the state-controlled roads have been assessed using traffic count volumes, proportion of heavy vehicles and annual growth rates provided by the DTMR regional office. The DTMR was unable to provide the equivalent standard axles (ESAs) for the various routes and these have been calculated based on AADT and the proportion of heavy/commercial vehicles.

This resulted in a range of ESAs of between 2.52 and 4.36. Growth rates, as provided by the regional office, were taken into account in the calculations and the applied rates adopted were between 0 per cent and 5 per cent. Where a development will create more than a 5 per cent increase in the existing ESA loading on a road, the DTMR requires an assessment of impact on the road pavement.

Early indications are that 80 per cent of the State-controlled transport routes identified in *Table 3.14.1* will be impacted in excess of 5 per cent. A summary of routes potentially affected and the daily percentage impact of the project-generated ESAs on the existing roads is provided in *Table 3.14.12*.

Table 3.14.12 Average Daily ESA Impact from the Project

State-controlled Roads	Section	Generated ESAs (ESA/day)	Maximum Daily % Increase in ESA/day	Increase in 20-year Pavement Loading by Project
Warrego Highway	Ipswich-Toowoomba	180	6%	0.7%
	Toowoomba-Dalby	180	5-25%	3.1%
	Dalby-Miles	627	25-65%	3.3-6%
	Miles-Roma	627	45-90%	1.5-5.8%
	Roma-Mitchell	450	23-66%	2-5.4%
Leichhardt Highway	Taroom-Miles	615	158%	4.6%
	Miles-Goondiwindi	625	155-240%	15.4%
Moonie Highway	Dalby-St George	625	12-57%	23%
Surat Developmental Road	Tara-Dalby	625	27-133%	28.2%
Dalby-Kogan Road		625	325%-545%	55.8%
Kogan-Condamine Road		625	710%	64.4%
Jackson-Wandoan Road		180-625	430-2700%	152.7%
Dalby-Jandowae Road		445	230-300%	125.8%

These impacts have been assessed against the 20-year life of the pavements, in accordance with DTMR guidelines.

The impact of haulage on the 20-year pavement loading on state controlled roads is significant on sections of the:

- Warrego Highway (Dalby-Miles, Miles-Roma and Roma-Mitchell)
- Leichhardt Highway (Miles-Goondiwindi)
- Moonie Highway (Dalby-St George)
- Surat Development Road (Tara-Dalby)
- Dalby-Kogan Road, Kogan-Condamine Road
- Jackson-Wandoan Road
- Dalby-Jandowae Road.

Much of this loading is a direct result of the preliminary estimate of the quarry material that may be required for the Gas Field development works. As these impacts could occur throughout the life of the Project, a development contribution will need to be calculated and agreed with DTMR (refer *Section 14.3.7)* if the estimated volume of quarry material transport is found to be necessary. This will be determined during detailed design.

It has not been possible to carry out a similar analysis for local government roads because there is no data available from which to derive traffic loadings. The majority of the local government roads within the Gas Field area are unsealed. An inventory of road conditions will be developed, in consultation with the relevant authority, prior to construction commencing.

QGC will manage road access and potential deterioration directly with the relevant authorities. It is expected that selected locations will require upgrades prior to construction and that water and maintenance grading (at QGC's expense and in liaison with the relevant authorities) will be required during concentrated construction periods. Any damage proven to have been caused by hauling Project pipes and equipment on gazetted roads will be rectified by agreement with the DTMR or the local government authority as appropriate.

The proposed process for assessing and agreeing on mitigation measures is set out in *Section 14.3.7.*

14.3.3.4 Spread of Pest Species

Transport of plant and equipment from other areas has the potential to spread pest species and diseases. Movements of personnel, pipe deliveries and camp servicing may also transport weed seed.

QGC recognises the importance of preventing the introduction and/or spread of pest species and diseases and has implemented management measures from the inception of the Project.

Further details in relation to pest species management are provided in *Volume 3, Chapter 7.*

14.3.3.5 Increased Noise for Residences Adjacent to Roads

It is not anticipated that the volume of traffic generated by the Project will require specific road noise measures. The key noise issue would be associated with hauling at night along routes fronted by residences. This would be anticipated only on major highways that already experience a high level of this type of traffic. Noise impacts from transport are discussed in *Volume 3, Chapter 13*.

14.3.3.6 Dust

Earth-moving activities such as clearing and grading well and compressor sites and pipeline corridors, trenching for pipelines and construction of access roads would all result in dust generation. Where construction activities are in proximity to roads, a dust nuisance may be created for users. In addition, the movement of heavy vehicles on unsealed roads in dry conditions would create dust hazards.

Dust management measures (refer *Section 14.3.6)* will be implemented throughout construction to minimise dust creation and improve overall safety of vehicle movements. Weather conditions will be monitored and, where conditions create unsafe dust hazards, works will be suspended in the area until it is safe to resume.

14.3.4 Emergency Access

Emergency facilities in the region have been reviewed (refer *Volume 8, Part A*) and access arrangements for construction will be documented in QGC's Emergency Response Plan.

14.3.5 Impacts on Road Infrastructure

14.3.5.1 Road Link Analysis

Each road link was assessed to determine the existing level of service on the State-controlled roads and the required level of service based on the estimated traffic generation (refer to *Table 3.14.13*).

Level of service generally describes the operational conditions within a traffic stream, and their perception by motorists. These conditions are described in terms of factors such as speed, travel time, freedom to manoeuvre, traffic interruptions, comfort, convenience and safety. In general, there are six levels of service, from A to F, with A representing the best operation and F the worst. The roads expected to be used by the Project currently have a level of service between A and C.

Table 3.14.13 Levels of Service over State Controlled Roads

Road	Section	Current AADT	Generated traffic volumes (VPD)	Existing level of service	New level of service
Warrego Highway	Toowoomba-Dalby	4500-17,500	350	C-E	C-E
	Dalby-Miles	2100-6500	510	B-D	B-D
	Miles-Roma	1200-3000	510	A-B	A-B
	Roma-Mitchell	750-1028	160	A	A
Leichhardt Highway	Taroom-Miles	640	720	A	B
	Miles-Goondiwindi	300-1850	720-740	A	A-B
Moonie Highway	Dalby-St George	1300-6400	740	A-C	A-C
Surat Developmental Road	Tara-Dalby	600-2200	580-720	A-B	A-B
Dalby-Kogan Road		300-500	740	A	A
Kogan-Condamine Road		130	440	A	A
Chinchilla-Tara Road		350-720	480	A	A
Tara-Kogan Road		160	480	A	A
Jackson-Wandoan Road		70-200	704	A	B
Dalby-Jandowae Road		600-800	160	A	A

The assessment was carried out for different scenarios of quarry material volumes. When only the road requirements were taken into account, the level of service on all roads was unchanged. However, when quarry material was allowed for in relation to all of the well sites and compressor stations it was found that there was potential for change on the following sections of road:

- Leichhardt Highway between Taroom and Miles
- Leichhardt Highway (Miles-Goondiwindi)
- Jackson-Wandoan Road.

On each of these road links there is the potential for the level of service to alter from Level A to Level B. In an A level of service, drivers are virtually unaffected by the presence of other drivers and there is an extremely high level of comfort and convenience. With a B level of service there is some impact from the presence of other drivers, with a slight lessening of the general level of comfort and convenience.

14.3.5.2 *Intersection Analysis*

The volume of traffic generated through Toowoomba has been estimated at 350 vehicles per day (refer to *Appendix 3.7, Table 5.1*). Assuming peak-hour volumes are 10 per cent of the daily volumes, the increase in traffic on the Warrego Highway is 35 vehicles per hour. Based on a 70 per cent/30 per cent directional split, the peak-hour volume in the major direction is 25 vehicles per hour. The AADT volume through Toowoomba City is 19,800 to 22,000 (refer *Table 3.14.2*). The Project-generated volumes will therefore have an insignificant impact on intersections through the city.

Similarly, the volume of generated traffic through Dalby has been estimated at 510 vehicles per day, with 35 vehicles travelling in one direction in the peak hour. An increase from 300 vehicles per hour to 335 vehicles per hour in one direction will have minimal impact on intersections through Dalby.

The access to the construction camps will have the most impact on the intersections of the road network. These accesses will affect the roads with an AADT less than 2000. The maximum numbers of vehicles leaving and entering the camp at any one time has been calculated at 160. The average delays to vehicles entering and leaving the camps either at the camp access itself or at intersections on the road network will, on average, be less than two seconds.

At present the definitive locations of these camps has not been decided and the assessment of the intersections with the road network will be conducted once the actual locations are known.

14.3.5.3 *Bridges*

No bridges on state-controlled roads proposed to be used by the Project for the Gas Field development have signed load limits. All haulage will be undertaken with standard truckloads and therefore no specific measures are expected in relation to bridges.

The appointed transport contractor will liaise with DTMR in relation to any loads that may require special permitting.

The load limits on any local government roads proposed for use as transport routes will be collated during detailed design and will influence the choice of the haul routes.

14.3.6 *Transport and Traffic Management Measures*

Mitigation measures to reduce the effects of Gas Field activities on the transport network are discussed for impacts caused by:

- an increase in traffic from QGC transport requirements
- interaction of QGC construction activities with existing transport networks.

14.3.6.1 Increased Traffic

Mitigation measures will include the following, as appropriate:

- Equipment and material transport routes and storage areas will be planned in consultation with local and state authorities to minimise disruption to residents and other road users.
- Delivery of project equipment will be planned to occur, where practicable, during periods when the least risk is posed to other road users and take into account local school bus routes.
- A transport logistics study will be undertaken during FEED. A road inventory will be carried out and agreement negotiated with the relevant authority on any necessary works required prior to or during construction activities to ensure the maintenance of safe road conditions. This may include:
  - extra road maintenance in the form of additional light grading, heavy grading and gravel re-sheeting
  - widening the existing unsealed road formation and additional maintenance
  - paving and sealing the more highly trafficked roads (e.g. Local Government-controlled roads providing access to construction
- All road closures and directives of road authorities will be strictly adhered to.
- Arrangements for temporary stockpiling or, on occasion, temporary abandonment of load (on trailers) will be addressed in materials and equipment delivery agreements to provide for contingency during wet season/flooding.
- Consultation, negotiation and permitting will be conducted with DTMR on movement of any oversized loads identified during detailed design.
- Relevant project-related equipment will be stored in designed laydown areas in proximity to sites of use within safe distances of main roads to reduce impacts to unsealed roads.
- The use of multi-person vehicles for travel to and from worksites will be encouraged.
- Personnel movements will be staggered to minimise the number of vehicle movements during peak periods, where practical.
- Buses will be used to transport personnel between camp sites and construction sites, where practical.

14.3.6.2 Construction Activities

Mitigation measures will include the following, as appropriate:

- A Road Use Management Plan (RUMP) will be implemented to address the use of safety vehicle signs and qualified flagmen where works impinge

on any road reserve (e.g. pipeline crossings).

- Warning signs in the vicinity of construction sites will alert personnel and the public of hazards.
- Dedicated and trained personnel, where appropriate, will coordinate traffic on the roadway with the movement of construction personnel and equipment during major plant and equipment deliveries or during pipeline construction within a road reserve.
- Dust management measures will be implemented (e.g. watering of pavement, reduced speed limits) during high dust risk (i.e. dry, windy conditions).
- Sealed road crossings will be bored to minimise disruption, where practicable.
- Pipeline construction in road reserves will be scheduled outside peak periods to minimise disruption.
- Any damage to roads that can be shown to be as a result of project activities will be reinstated to the satisfaction of the local authorities.

14.3.7 Procedures for Assessing and Agreeing Mitigation

At this stage of the Project, QGC cannot commit to actual transport methods and routes. This assessment is based on what QGC believes will be the worst-case scenario in relation to impacts on Queensland's road infrastructure. This has enabled identification of the potential impacts on the road network and provides a basis for further negotiations.

The nominated transport strategy and routes will be reviewed with the construction and haulage contractors once they are appointed and the road impact assessment will then be revised to reflect the actual routes and transport methods to be used.

Once the road impact assessment has been revised, QGC and/or its appointed construction contractor will negotiate with the DTMR or other identified road authorities (e.g. regional councils) about the level of compensation and/or road works that are required for the Project.

Depending upon the transport method and the routes selected, there is potential for the following works to be agreed with the DTMR or regional councils:

- widening/strengthening of bridge structures
- widening of some sections of road
- resurfacing of roads
- compensation for road pavement impacts.

14.3.8 Rail

Rail transport will be taken into consideration in finalising the overall transport strategy.

There are no construction works for the Gas Field proposed at this time in or adjacent to any rail reserve.

Management measures in place during construction will ensure that no unauthorised access to rail infrastructure occurs as a result of Project activities.

14.3.9 Shipping

Refer to *Volume 5, Chapter 15.*

14.4 CONCLUSION

The model developed for this Environmental Impact Statement (EIS) to quantitatively predict the likely transport impacts from Gas Field Component activities highlights those roads that have the potential to be adversely impacted by the Project. A methodology for determining the overall impact and management strategies has been proposed for use during detailed design.

The greatest impact will occur during construction of the Gas Field, primarily through the delivery of equipment and materials.

A number of mitigation strategies have been developed to ensure that road safety is not diminished. In some cases it is likely that road safety will be enhanced due to required upgrades. A summary of the impacts outlined in this chapter is provided in *Table 3.14.14*.

Table 3.14.14 Summary of Impacts for Transport

Impact assessment criteria	Assessment outcome
Impact assessment	Negative
Impact type	Direct
Impact duration	Long- term
Impact extent	Local
Impact likelihood	High

Overall assessment of impact significance: moderate to major, depending on the strategies to be implemented and the final transport corridors to be used. However, once transport options are better defined during the detailed design phase, and roads are identified in consultation with relevant government departments and agencies, it is expected that the impact from transport on roads will be minor to moderate.